should ensure that for those markets not on the list the following three criteria are cumulatively met:

(i) the presence of high and non-transitory barriers to entry;

(ii) a market structure which does not tend towards effective competition within the relevant time horizon of the market review; and

(iii) the insufficiency of competition law alone to adequately address the market failure(s) concerned.

2.30 Whilst, as we set out in paragraph 1.39 of our January 2008 consultation, we do not believe that the passing of these the three criteria test constitutes a legal requirement for the undertaking of a market review, and where appropriate the imposition of regulatory obligations, we consider that all three criteria are cumulatively met in the case of the retail market for low bandwidth leased lines and the wholesale market for trunk segments. This is set out in the relevant parts of this statement in more detail. For the discussion around barriers of entry, please see 7.51 for the retail market and 7.170 for the wholesale trunk market. The competitive structure of both markets is analysed in 7.51 and 7.176 respectively and a discussion around the sufficiency of competition law alone can be found in 7.46 for the retail market for low bandwidth leased lines and in 7.173 for the wholesale market for trunk segments.

The market review process

2.31 Each market review is carried out in three phases:

- a definition of the relevant market or markets (with regards to the scope of both the product as well as the geographic market boundaries);
- an assessment of competition in each market, in particular whether any undertakings have SMP in a given market; and
- an assessment of the appropriate regulatory obligations which should be imposed where there has been a finding of SMP.

2.32 More detailed requirements and guidance concerning the conduct of market reviews are provided in the Directives, the Act, and in additional documents issued by the Commission, the European Regulators Group (ERG) and Independent Regulators Group (IRG). As required by the new regime, in conducting this review, Ofcom has taken the utmost account of two European Commission documents: the Recommendation and the "Guidelines on market analysis and the assessment of SMP"[13] (the SMP Guidelines).

The SMP Guidelines

2.33 The Commission issued the SMP Guidelines in July 2002 which provide guidance on the assessment of the relevant markets and the designation that an operator has

[13] Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03).

SMP in any given market. Oftel has produced additional guidelines on the criteria to assess effective competition based on the SMP Guidelines[14].

2.34 Ofcom, in conducting its analysis set out in this consultation document, has taken the utmost account of both the Recommendation and the SMP Guidelines when identifying a services market and when considering whether to make a market power determination under Section 79 of the Act.

The 2003/04 review and the existing regulation

2.35 The 2003/04 Review found BT to have SMP in the wholesale markets for low and high bandwidth TISBO (i.e. speeds of up to and including 155 Mbit/s), AISBO at all speeds, and trunk segments. As a result of the SMP findings, a series of regulatory obligations were imposed on BT in these markets. These were:

- a general obligation to provide access on reasonable request;
- a requirement not to unduly discriminate;
- basis of charges obligations (cost orientation and a cost accounting system);
- charge controls on TISBO SMP products;
- accounting separation obligations;
- a requirement to publish a reference offer;
- an obligation to give 90 days notice of changes to prices, terms and conditions for existing TISBO services;
- an obligation to give 28 days notice of the introduction of prices, terms and conditions for new TISBO services;
- same day notification of changes to prices, terms and conditions for wholesale trunk segment products;
- a requirement to provide quality of service information;
- a requirement to notify technical information with 90 days notice; and
- obligations relating to requests for new network access.

2.36 BT is also currently subject to:

- a Direction under the general access condition to provide Partial Private Circuits (PPCs) at a range of bandwidths, Radio Base Station (RBS) backhaul link products, and Local Loop Unbundling (LLU) backhaul products, subject to specific terms and conditions;
- a Direction under the cost orientation condition covering pricing matters relating to PPCs and LLU backhaul;

[14] see www.ofcom.org.uk/static/archive/oftel/publications/about_oftel/2002/smpg0802.htm

- a Direction under the quality of service condition to require specific information in respect of PPCs;
- a Direction under the general access condition to provide Ethernet-based LLU backhaul products, subject to specific terms and conditions; and
- a Direction under the cost orientation condition covering pricing matters relating to Ethernet-based LLU backhaul.

2.37 In addition, under the 2003/04 Review Ofcom found KCOM to have SMP in the wholesale low and high bandwidth TISBO markets (i.e. speeds up to and including 155 Mbit/s), and the AISBO market at all speeds in the Hull area. As a result, we imposed the following obligations on KCOM in these markets:

- a general obligation to provide access on reasonable request;
- a requirement not to unduly discriminate;
- cost orientation and a cost accounting system;
- requirement to publish a reference offer; and
- requirement to notify technical information with 90 days notice.

Purpose of this review

2.38 The current regulatory framework has worked well in promoting competition in some markets, but in Ofcom's view has failed to deliver improved competitive conditions in others. The pricing and quality of BT's wholesale leased lines have been a cause of concern for some time. As operators start rolling out Next Generation Networks (NGNs), it is important that the regulatory framework sets the right incentives for investments. Ofcom considers that we need to address the weaknesses to the current regime to ensure greater competition and innovation in the coming years in leased lines markets. In addition, many stakeholders have since the completion of the 2003/04 Review argued that the pace of changes in the market required a new market review. Finally, BT argued that competitive conditions have changed significantly since the last review was completed.

2.39 For these reasons, Ofcom believes it is the right time to review the current regulatory framework. To this end, we set out in the January 2008 consultation our proposals for a new regulatory framework.

2.40 During the January 2008 consultation, many respondents put forward arguments in support of a different market definition for wholesale very high bandwidth TISBO than the one proposed by Ofcom. In particular, they argued that 155 Mbit/s TISBO were in a different market from 622 Mbit/s TISBO, and that in the provision of the former, BT continued to have SMP in some parts of the country, as the only supplier of these services. They also argued for Ofcom to modify its approach to identifying geographic markets by taking into consideration a considerably shorter build distance than the one proposed by Ofcom.

2.41 After considering the respondents' views and arguments, we reviewed our market definition in the light of new evidence. We published a set of revised proposals for the

high bandwidths 155 Mbit/s and 622 Mbit/s TISBO markets in the July 2008 consultation.

2.42 We have now considered the responses to both consultations and have reached our conclusions as to what we believe is the appropriate market definition, SMP assessment and regulatory remedies for the leased lines markets in the UK. We consider that a package of measures that combines the January 2008 and July 2008 proposals, with some amendments to take into considerations the views of stakeholders, are the right way forward.

Outline of this document

2.43 The main body of this consultation document is organised as follows:

1. Summary
2. Introduction
3. Retail product market definition
4. Retail geographic market definition
5. Wholesale product market definition
6. Wholesale geographic market definition
7. SMP assessment
8. Regulatory remedies and impact assessment

2.44 The following Annexes are enclosed:

1. Responding to this consultation
2. Ofcom's consultation principles
3. Consultation response cover sheet
4. Consultation question
5. List of respondents to the July 2008 consultation
6. Geographic analysis
7. Aggregation nodes and geographic trunk analysis
8. SMP Conditions and directions
9. Reassurance letters and voluntary undertakings
10. Notification in relation to the market for high bandwidth AISBOs in the Hull area
11. Glossary

Section 3

Retail product market definition

Introduction

3.1 In this Section we first summarise the product market definitions set out in our January and July 2008 consultations. We then set out and respond to stakeholders' responses to these proposals before providing our conclusions in regard to the appropriate retail product market definitions.

Summary of proposals

3.2 In the January and July 2008 consultations we conducted analysis to assess the relevant retail product market definitions. Our proposed market definitions are set out in Table 3.1 below.

Table 3.1: Summary of proposed retail product market definitions in the January 2008 consultation document, as modified in the July 2008 consultation document

Retail product markets	Bandwidth breaks			
Traditional interface retail leased lines	**Low** Up to and including 8Mbit/s (including analogue and SDSL services)	**High** Above 8Mbit/s up to and including 45Mbit/s	**Very High** Over 45 Mbit/s and up to and including 155 Mbit/s	**Very High** Over 155 Mbit/s
Alternative interface leased lines	**Low** Up to and including 1Gbit/s		**High** Over 1 Gbit/s	

Ofcom's approach to market definition in the consultative documents

3.3 These proposals resulted from an application of Ofcom's standard approach to market definition, which takes utmost account of the relevant guidelines and recommendations published by the Commission. Under this approach, relevant product and geographic markets are identified by using the "hypothetical monopolist test" to identify the scope for demand- and supply-side substitution. A product is considered to constitute a separate market if a hypothetical monopoly supplier could impose a "small but significant non-transitory increase in price" (SSNIP) above the competitive level without losing sales to such a degree as to make this price rise unprofitable. If the price rise would be unprofitable, because consumers would switch to other products, or because suppliers of other products would begin to compete with the hypothetical monopolist, then the market definition should be expanded to include the substitute products.

3.4 It may sometimes be appropriate for products not linked by demand or supply-side substitution to be placed in the same market if competitive conditions in their supply are sufficiently homogeneous (although this criterion is perhaps more usually used in the context of geographic market definition as a reason for aggregating different areas not linked by demand or supply side substitution rather than in the product market context).

3.5 Although many of the markets this review is concerned with are wholesale markets, Ofcom first considered market definition at the retail level. This is necessary because the demand for wholesale services like those reviewed here is a derived demand and depends on the demand for the retail services which it supports. In general, where the cost of an upstream input accounts for a sufficiently large proportion of the retail price of a product, the range of available substitutes at the retail level will inform the likely range of substitutes for the wholesale service. This is because a rise in the price of a wholesale service which is passed through in the price of one retail service will cause retail customers to switch to substitute retail products, reducing demand for the wholesale input.

3.6 Because of the complexity of product market definition in business connectivity markets, Ofcom approached this by means of a sequence of tests to identify services which are sufficiently close substitutes for each other to be regarded as part of a single market. The sequence of tests was as follows:

1. Are analogue and digital SDH/PDH leased lines in the same market?

2. Are traditional interface circuits in the same market as alternative interface circuits?

3. Are Leased lines and Virtual Private Networks (VPNs) in the same market?

4. Are leased lines in the same market as Broadband access services provided using ADSL and SDSL technologies?

5. Are there separate markets for circuits at different bandwidths?

6. Should Wave Division Multiplexed-based retail services be included in the markets for leased lines?

3.7 Ofcom's assessment of these questions took into account:

i) The results of a survey of end users;

ii) Analysis of differences in relative prices and trends in usage;

iii) Qualitative analysis of differences in the characteristics of the services; and

iv) Any other relevant evidence provided to us by stakeholders.

3.8 A summary of this assessment follows.

1. Are analogue and digital SDH/PDH leased lines in the same market?

3.9 We proposed in the January 2008 consultation that analogue lines belonged to the same market as low bandwidth retail digital leased lines (see discussion at paragraphs 3.52 to 3.108 of the January 2008 consultation).

3.10 Our findings were predominantly based on evidence that analogue services were likely to be demand-side substitutes for low bandwidth digital leased lines. Firstly, analogue leased lines offer broadly equivalent functionality to low bandwidth digital leased lines. Secondly, our analysis of underlying costs suggested that the prices in a competitive market of analogue and low bandwidth digital leased lines were likely to be similar. Similar functionality and prices makes it likely that a SSNIP above the

competitive price level of analogue circuits would be unprofitable due to switching to low-bandwidth digital circuits and vice versa.

3.11 This view was supported by our end-user survey analysis which found that a relatively high number of consumers of each service claimed that they would be likely to switch to other services in response to a SSNIP (in particular the stated amount of switching tended to significantly exceed the critical loss[15] for each service). This also suggests that the relevant market is wider than analogue or low bandwidth digital services alone.

3.12 Ofcom therefore proposed to include analogue and digital SDH/PDH in the same market because:

- The functionality of the two services is similar;
- The underlying costs of providing analogue and digital lines are similar which in turn suggests that their prices in a competitive market would be similar; and
- End-user research suggested that customers would be likely to switch between them in response to a SSNIP.

2. Are Traditional interface leased lines and alternative interface leased lines in the same market?

3.13 In the January 2008 consultation, we proposed that traditional interface (TI) leased lines belong in separate markets to AI (AI or Ethernet) services. Our analysis was set out in paragraphs 3.109 to 3.186 of the January 2008 consultation.

3.14 Ofcom based its proposal on an assessment of the likely extent of demand and supply-side substitution between TI and AI services. It took account of a qualitative comparison of the functionality of TI and AI services, together with an analysis of relative prices, evidence of customers' sensitivity to changes in prices from our end-user survey and an assessment of any costs associated with switching between these services.

3.15 We found that there were important differences in the functional capabilities of TI and Ethernet services. In addition, a comparison of relative prices and trends in purchases of these services suggested that users do not switch rapidly between the two services even in response to significant price differentials. This was supported by survey evidence and the existence of significant switching costs. This evidence suggested that AI and TI services are not sufficiently close demand-side substitutes to be regarded as part of the same market.

3.16 Supply-side substitution was also considered not to be relevant since most suppliers already provide both AI and TI services. This means that supply-side substitution, even if technically possible, would not provide any additional constraint on charges over and above that captured by the demand-side analysis.

[15] The critical loss is the amount of switching just sufficient to render the SSNIP unprofitable.

3. Are Leased lines and VPNs in the same market?

3.17 In the January 2008 consultation, we proposed that VPNs belong in separate markets to leased line services (see discussion at paragraphs 3.187 to 3.255 of the January 2008 consultation). We considered this to be the case both with respect to VPNs accessed over ADSL links and VPNs provided over leased lines. Ofcom considered evidence from relative prices, a survey of end-users and an assessment of switching costs.

3.18 VPNs accessed via Internet links are unlikely to be substitutes to point-to-point leased line networks because they do not offer comparable levels of reliability, performance or security, all of which are of considerable importance to leased line users. Such VPNs are also considerably cheaper than leased lines. In the January 2008 consultation, we contrasted typical broadband rental charges of £20 per month and connection fees as low as £175 with a figure of £2,000 per annum or more for the "equivalent" leased line costs. We argued that, with these price savings available, if internet-VPNs were able to address the same needs as a leased line service then the majority of users would have switched to such VPN services already. The fact that significant demand for leased lines remains despite the much higher prices suggests that these VPNs do not address the same customer needs and are not close demand-side substitutes.

3.19 In contrast, VPNs accessed via leased lines do offer equivalent service features, but they make heavy use of leased lines as an input and involve the additional provision of a network management function. For this reason these VPNs are best characterised as a downstream service rather than as a substitute to leased lines. The fact that leased lines are a significant input to such VPNs also limits the extent to which the availability of these VPNs is able to constrain leased line prices.

3.20 The end user survey included a number of questions relevant to the substitutability of VPNs and leased lines. Responses suggested that a relatively high proportion of businesses without VPN services would consider switching to a VPN to avoid a 10% rise in the price of *all* the other business connectivity services that they were using. We noted that switching at the level suggested would be likely to exceed the critical loss needed to make the price rise unprofitable, which would tend to suggest a broad market definition. However, responses to other questions suggested that VPNs were less likely to be seen as a good substitute for leased lines. In the light of this, we explained that these results were best understood as an indication that end-users might be willing to switch to VPN services as part of a wider decision to replace all of their connectivity services, rather than implying that such switching behaviour would constrain a hypothetical monopolist of either an AI or TI leased line service over relatively short timeframes. Our end-user research also suggested that VPNs were often purchased alongside leased lines, rather than as a substitute for them.

3.21 We also identified switching costs which could inhibit substitution between VPNs and leased lines. In particular, it rarely makes sense to switch to a VPN on a link-by-link basis and migrating to a VPN therefore requires careful and costly management. VPNs are usually managed by third parties, so any decision to move to a VPN is likely to involve a more wide-ranging decision to outsource functions such as IT support, which can also involve significant changes to staff and equipment. These costs make it unlikely that customers will substitute to a VPN simply in response to a SSNIP on leased line prices.

3.22 Ofcom also considered that supply side substitution by VPN providers would not act as a constraint on leased line prices. This was because the sunk costs needed to

construct a network in order to provide symmetric broadband (leased line) services would be prohibitive, whilst those VPN providers who already had Ethernet or SDH/PDH networks were likely already to be supplying leased lines and as such would not represent an additional constraint over and above those identified in the demand-side analysis.

4. Are leased lines in the same market as services provided using ADSL and SDSL technologies?

3.23 We proposed that ADSL services belong in a separate market to leased lines and that SDSL and leased lines operate in the same market (see discussion at paragraphs 3.256 to 3.311 of the January 2008 consultation).

3.24 The evidence that we reviewed included an analysis of the price of these services, end-user survey results and an assessment of any differences in the functionality of the two services.

3.25 The evidence indicated that there were actual and perceived functional differences in leased line and ADSL services. These had narrowed since the last market review in 2004, in particular because of the improvement of overall ADSL quality and upload speeds. However, it remained the case that ADSL is generally seen as a relatively contended service, where bandwidth is not guaranteed and which is still associated with poorer service quality in terms of latency, jitter and overall throughput. The end-user research indicated that these factors, in particular reliability and availability, were critically important to leased line users.

3.26 Ofcom also made a comparison of relative prices and trends in purchases of ADSL and leased line services. This suggested that users do not switch rapidly between the two services even in response to significant price differentials. This suggests that ADSL and leased lines operate in separate markets.

3.27 In the case of SDSL, our assessment was that generally its functionality approximates that of leased lines (much more so than was the case with ADSL). As is the case with leased lines, SDSL connections offer the ability to support dedicated, i.e. uncontended, symmetric bandwidth at speeds comparable to digital leased lines (i.e. up to 2Mbit/s). Our pricing analysis also suggested that switching might be expected to occur between SDSL and leased lines in response to a SSNIP.

3.28 In addition, significant differences in price between even top-end ADSL and SDSL remain. For example, BT's SDSL package starts at £510 (ex VAT) per quarter whereas its highest specification 'Business Broadband' (ADSL) service is priced at £195 per quarter. Even with the caveat that current SDSL prices may be above the competitive level, the magnitude of the difference suggests that a 10% change in relative prices is unlikely to induce switching.

3.29 Ofcom's survey evidence suggested that symmetry may be less critical than other features of leased lines, but customer willingness to sacrifice it in response to a SSNIP was still limited. Most SDSL users stated that they would switch (if at all) to other symmetric services in response to a SSNIP on SDSL. In addition, unlike ADSL, SDSL requires an additional line for voice telephony.

3.30 Ofcom therefore proposed that retail leased lines and asymmetric broadband (ADSL) services are in separate markets but that symmetric broadband (SDSL) services are sufficiently close substitutes to retail leased lines for them to be part of the same (low bandwidth traditional interface) market.

5. Are there separate markets for circuits at different bandwidths?

3.31 In the January 2008 consultation Ofcom proposed to define three distinct markets for TI retail leased lines:

- Low bandwidth: up to and including 8Mbit/s;
- High bandwidth: above 8Mbit/s, up to & incl. 45Mbit/s; and
- Very high bandwidth: above 45Mbit/s.

3.32 We also proposed to define two distinct markets for AI retail leased lines:

- Low bandwidth: up to and including 1Gbit/s; and
- High bandwidth: above 1Gbit/s.

3.33 Our analysis of these issues is set out in paragraphs 3.314 to 3.359 of the January 2008 consultation.

3.34 In the light of responses to the January 2008 consultation, Ofcom modified its proposal for the very high bandwidth TI market. Ofcom's revised proposals for this market were set out in the July 2008 consultation and are discussed below.

3.35 Ofcom's proposal to define separate markets for low, high and very high bandwidth TI circuits and high and low bandwidth AI circuits was based on the following considerations. Firstly the results of Ofcom's survey suggested that retail customers are rarely willing to compromise on bandwidth. On the other hand, Ofcom noted that there is at least the potential for demand-side substitution between lower and higher bandwidth circuits because of the functional equivalence between a high bandwidth circuit and multiple low bandwidth circuits of similar total bandwidth. However, this is not sufficient for there to be a single market, since it does not imply that either demand- or supply-side substitution would be sufficiently strong to constrain a SSNIP above the competitive price imposed by a hypothetical monopolist of either service.

3.36 In order to address this question, Ofcom used the market definition methodology developed for the 2004 market review. The basis of this is a consideration of the lowest cost way of meeting a particular bandwidth requirement and the extent to which this is affected by a SSNIP. If the analysis suggests that there is likely to be switching between higher and lower bandwidth circuits over a significant range of bandwidth demand, this indicates that circuits at different bandwidths form a single market due to the existence of a 'chain of substitution'. As well as price differences, the existence of this chain may depend on the proportion of customers whose total demand for bandwidth makes it likely that they would consider switching in response to a SSNIP.

3.37 For the purposes of the SSNIP test it is necessary to identify the competitive level of prices. In a competitive market, prices will tend towards costs, so it is appropriate to use a measure of cost as a proxy for the competitive level of retail prices. In order to address this question, we used current BT wholesale price data as a proxy for competitive retail prices and applied a 10% SSNIP to those prices. BT's wholesale prices are subject to a cost orientation obligation and, in the case of TISBO, a charge control as well.

3.38 The price analysis set out in the January 2008 consultation suggested that, for TI circuits, bandwidth breaks existed at around 8Mbit/s, 34/45Mbit/s and 155Mbit/s. This was because there were significant price jumps at these levels (indicating that at these levels a SSNIP applied on a bandwidth service below these levels would not prompt switching to higher bandwidth services). These results continued to apply under a range of different scenarios which we conducted to test the sensitivity of our initial results.

3.39 However, in the light of responses to the January 2008 consultation, Ofcom revised its proposal for the very high bandwidth TI market. Details of the revised proposals and Ofcom's reasoning were published in the July 2008 consultation and are described below, later in this Section.

3.40 In the case of AI leased lines, Ofcom considered the price of BT's WES service as a possible proxy. This is because BT is subject to a requirement for its WES charges to be "cost oriented". However, since BT's financial statements suggest that WES prices vary with bandwidth to a greater extent than BT's reported costs, Ofcom also considered BT's underlying costs of providing AI services, and placed most weight on the latter.

3.41 Whilst BT's WES prices exhibit a significant "bandwidth gradient", that is, they increase relatively sharply as bandwidth increases, the underlying costs of AI circuit provision do not. This is because the costs of duct and fibre form a high proportion of the total cost and, given the point to point dedicated circuit architecture currently used, are generally invariant with bandwidth. However, Ofcom found that the cost of the equipment which a customer needs in order to use circuits at bandwidths above 1Gbit/s (i.e. at 2.5Gbit/s and 10Gbit/s) is significantly greater than the cost of the equipment for use with circuits at bandwidths up to and including 1Gbit/s. This leads to the total costs per circuit of the high bandwidth circuits above 1Gbit/s being significantly greater than the total costs per circuit of the low bandwidth circuits, whilst total costs per circuit were relatively constant at bandwidths up to and including 1Gbit/s.

3.42 On the basis that it was reasonable to assume that this cost pattern would be reflected in competitive prices for AI circuits, Ofcom concluded that demand-side substitution to high bandwidth AI circuits in response to a SSNIP in the price of low bandwidth circuits would be unlikely to be sufficient to render such a SSNIP unprofitable.

3.43 Ofcom also considered the possibility of supply-side substitution, but found that a SSNIP in the price of low bandwidth circuits would be unlikely to attract additional entry from suppliers of high bandwidth circuits as most providers already offer services at a variety of bandwidths. Therefore Ofcom identified no additional competitive constraint from supply side substitution, over and above those already reflected in the demand-side analysis.

3.44 In addition, Ofcom reviewed competitive conditions across different bandwidth AI services. Ofcom found evidence of significant differences in the degree of competition between low and high bandwidth AI circuits. In particular, BT's share of the retail low bandwidth AI market was 72% whilst its share of the retail high bandwidth market was 13%.

3.45 Lastly, Ofcom made a forward looking assessment of foreseeable developments in the market. In particular, Ofcom recognised that the rollout by BT of its DWDM-based backhaul network (project ORCHID) could have the effect of reducing the magnitude

of the difference in the costs between low and high bandwidth circuits. This could, in principle, increase the potential for substitution between low and high bandwidth AI circuits. The evidence suggested, however, that the incremental cost of providing higher bandwidth circuits would remain sufficient to justify a continued distinction between low and high bandwidth AI markets.

3.46 In the light of the absence of demand or supply-side substitution and the difference in competitive conditions, Ofcom defined separate markets for low and high bandwidth retail AI circuits.

6. Should Wave Division Multiplexed-based retail services be included in the markets for leased lines?

3.47 We proposed that WDM-based retail services were not part of either the very high bandwidth AI or TI markets. The analysis of this question is set out in paragraphs 3.360 to 3.394 of the January 2008 consultation.

3.48 This view was based on the following evidence which suggested that demand-side substitution would be limited. Firstly, neither TI nor AI circuits can provide all the functionality of a WDM circuit. A particular feature of the latter is that it is possible to increase the capacity of an existing WDM circuit quickly and at low incremental cost. Secondly, there is an additional cost associated with WDM equipment. The evidence suggested that customers who need the enhanced functionality of WDM services would be willing to pay the necessary premium but that WDM circuits will be used largely by this group of customers.

3.49 Our view was that supply-side substitution would not constrain the price of WDM services.

3.50 On this basis we excluded WDM from the leased line markets which are the subject of the market review.

The revised July 2008 consultation proposals

3.51 In the light of responses to the January 2008 consultation, Ofcom reviewed the definition of the very high bandwidth TISBO market. We then published the July 2008 consultation in which we proposed a revised definition of the markets for very high bandwidth TI services (defined in the January 2008 consultation to comprise all 155 Mbit/s and 622 Mbit/s TI services). Ofcom now proposed to define two separate markets for the following services:

- very high bandwidth TI retail services – over 45 Mbit/s and up to and including 155 Mbit/s; and
- very high bandwidth TI retail services – over 155 Mbit/s.

3.52 The definition of the very high bandwidth TI retail services markets proposed in the July 2008 consultation differed from that proposed in the January 2008 consultation only in one respect, that is, the additional bandwidth break at 155Mbit/s. Other aspects of the market definition, for example the exclusion of AI circuits and ADSL and VPN services, were unchanged from January.

3.53 Table 3.2 sets out these proposed market definitions.

Table 3.2: Summary of proposed retail product market definitions from the July 2008 consultation

Retail product markets	Bandwidth breaks	
TI (digital) retail leased lines	**Very High 155 Mbit/s** Over 45 Mbit/s and up to and including 155 Mbit/s	**Very High 622 Mbit/s** Over 155 Mbit/s

Responses to the consultations and Ofcom's response

3.54 In the January 2008 consultation we asked the following questions in relation to our retail market analysis:

Question 1: Do stakeholders agree with our proposed retail market definition? In particular, do you agree that separate markets continue to exist for TI and AI retail leased lines?

Question 2: Do stakeholders believe that there is evidence that might support an alternative view?

3.55 In the July 2008 consultation we asked the following questions in relation to our retail market analysis:

Question 1: Do stakeholders agree with our retail market definition proposals? In particular, do you agree with our proposal to define separate product markets for TI (TI) retail leased lines - 155 Mbit/s services and TI (TI) retail leased lines - 622 Mbit/s services?

3.56 The following sub Sections summarise and respond to stakeholders' responses to these questions and also to more general objections raised in relation to our analysis of retail markets.

3.57 A number of respondents felt that we had defined an unduly narrow low bandwidth retail leased line market. However, there was no general agreement amongst stakeholders as to the correct way to define the market.

3.58 Stakeholders also raised the following specific issues:

i) The decline in retail leased lines since the last market review suggests that these services operate in broader markets;

ii) Ethernet operates in the same market as low bandwidth retail leased lines;

iii) ADSL services operate in the low bandwidth retail leased line market;

iv) 155 Mbit/s and 622 Mbit/s services operate in separate product markets; and

v) All AI services (irrespective of bandwidth) operate in the same market.

3.59 These issues are considered below, where we also provided Ofcom's response to the issue raised.

I. Does the decline in retail leased line volumes suggest a broader product market?

3.60 BT raised a point regarding the decline in retail leased line volumes since the 2003/04 Review. In particular, it claimed that volumes of retail leased lines had more than halved over this period.[16] In making these comparisons, BT cited the volume data set out in table B.1 of the 2003/04 Review and also the data presented in Figure 65 (Annex 5) of the January 2008 consultation.

3.61 BT considered that this decline supported the view that retail leased lines compete with other services such as Ethernet and ADSL.

3.62 We consider that the observation that some customers have migrated from leased lines to other products is not sufficient to place these other products in the leased lines market. The relevant question, for the purposes of market definition, is whether switching to these and other products would be sufficient to render unprofitable a SSNIP above the competitive price by a hypothetical monopolist of retail low bandwidth leased lines. Ofcom considered the evidence for the existence of such a constraint on leased line prices in chapter 3 of the January 2008 consultation. Switching to two of the most likely candidate substitutes, VPNs and asymmetric broadband access, is considered in detail in paragraphs 3.187 onwards and 3.256 onwards respectively. In both cases, a number of indicators are considered, including customer responses to questions about willingness to switch to other services, functionality, prices, usage patterns and switching costs and in both cases it is concluded that these products should not be considered as part of the same market as leased lines.

3.63 Nonetheless, we have given the issue further consideration and set out some further analysis below.

3.64 The evidence suggests that there has been some migration of leased line customers to services supplied using other technologies. It is likely that this will continue in future, perhaps particularly for customers who currently use the lowest bandwidth retail leased lines. Some such customers may find that their needs can be met at lower cost by an asymmetric broadband access service based on ADSL technology.

3.65 However, Ofcom notes that levels of prices and profits do not suggest that migration to other technical solutions, even combined with the effect of switching to alternative suppliers of similar products within the low bandwidth leased lines market, has so far had a marked effect on BT's prices or profits. It is clear from the analysis of the retail low bandwidth leased lines market set out in Ofcom's consultative document that BT's profit margins in this market remain very high without any apparent downward trend (see especially paragraphs 7.65 – 7.76 of the January 2008 consultation).

3.66 Indeed, given the differences in relative prices identified, the extent of switching away from leased lines in fact appears rather limited. The fact that there continues to be significant retail demand for low bandwidth leased lines, despite the availability of other products at often significantly lower prices, suggests that these products are

[16] Specifically, BT compared the volume data set out in table B.1 of the 2003/04 LLMR and in Figure 65 (Annex Five) of the January 2008 consultation.

not sufficiently close substitutes to form part of the same market or to constrain BT's SMP.

3.67 Even putting this issue to one side, our view is that low bandwidth retail leased lines have not fallen to the extent claimed by BT:

i) First, much of the apparent fall in volumes of digital leased lines cited by BT is likely to be explained by the fact that the data sets used in each market review are not directly comparable. In particular, there are various factors which limit the comparisons that can be meaningfully drawn between the volume data presented in the 2003/04 LLMR and the January 2008 consultation. As we explain below, these factors are likely to mean that the volumes reported in the 2003/04 Review overstate the 'true' number of retail leased lines that were supplied at that time, and the figures reported in the January 2008 consultation (i.e. specifically in Figure 65 of Annex 5) are likely to understate the 'true' number of leased lines that are now supplied; and

ii) Second, we provide information on market trends and technological developments in the retail leased lines market in the UK. These suggest that sales of low bandwidth TI digital leased lines have remained fairly constant over the period reviewed.

Data comparisons

3.68 As noted above, the data presented in Table B.1 of the 2003/04 Review are likely to overstate the number of 'true' retail leased lines that were supplied from 1997-2003.

3.69 First, BT had previously informed us that many of the circuits that were reported in the 2003/04 Review included circuits that were no longer 'active'. These were circuits that had previously been supplied at some point in time, but which customers had subsequently ceased purchasing. Many of these 'ceased' circuits continued to be included in BT's systems (particularly older circuits). For the purposes of the January 2008 consultation, BT attempted to remove all ceased circuits from the volumes data that they provided to us. Therefore, the 2008 BT data attempts to only include circuits that are revenue-generating. BT had previously informed us that for this reason the two data sets that it respectively provided under each market review are not comparable.

3.70 Second, the digital leased lines set out in Table B.1 of the 2003/04 Review include leased lines that were sold to wholesale providers under retail tariffs.[17] This implies that Table B.1 is likely to include leased lines that should be accounted for in BT's wholesale sales. Another way of looking at this is that some leased lines in Table B.1 are double-counted i.e. whenever a leased line was supplied by BT to an OCP and then resold by that OCP as a leased line to an end user, the same leased line could appear twice in the statistics.

3.71 Conversely, the data presented in Figure 65 of the January 2008 consultation appears to understate the amount of retail leased lines sold. This is partly because of certain gaps in the trend data. In particular, some CPs did not provide us with useable trend data and more generally the trend data provided by CPs was

[17] BT started to offer PPCs (i.e. wholesale leased lines) in the UK in August 2001 and from December 2002 price regulation of these wholesale services was put in place. Prior to this, OCPs acquired leased lines under retail tariffs (meaning that all their 'wholesale' requirements were included in the 'retail sales' set out in Table B.1). OCPs started to migrate to wholesale tariffs from 2001, although the shift was a drawn out process. This is discussed in paragraphs B. 27 - B.32 of the 2003/04 Review.

significantly less complete than the per circuit data on which we based our market share analysis. Specifically, our comparison of these two data sets indicates that the trend information is likely to understate overall volumes by up to one third.

3.72 Thus, the trend information in Figure 65 of the 2008 January 2008 consultation is likely to broadly present the trends across business connectivity services from 2004-06, but drawing comparisons between this trend information and that which was used in our previous review is likely to be of limited use.

3.73 We do not agree that the decline in retail leased line volumes means that we should define retail leased line markets more broadly.

II. Does Ethernet belong in the TI retail leased line market?

3.74 We have considered whether trends in the retail low bandwidth leased line market suggest that Ethernet (AI) and SDH (TI) circuits belong in the same retail market. Some indication of market trends was set out in the January 2008 consultation (see Figure 66 of Annex 5). Whilst this shows that sales of analogue lines have fallen, sales of low bandwidth TI digital leased lines remained fairly constant over the period reviewed. Volumes of digital circuits below 2Mbit/s actually increased in 2006, after falling somewhat in 2005. The number of low bandwidth Ethernet circuits increased over the period, but in 2006 remained well below the numbers of low bandwidth SDH and analogue circuits. These patterns of demand do not suggest that there is yet a general trend for Ethernet circuits to replace SDH and analogue circuits. In addition, there was only a small decline in the overall number of low bandwidth circuits (i.e. the total for all the services shown in figure 66). Our discussions with various users of leased lines indicate that the functional differences between Ethernet and TI leased lines described in paragraphs 3.119 to 3.139 of the January 2008 consultation continue to limit the extent to which they are seen as substitutes by customers.

3.75 BT considered that Ethernet services belong in the low bandwidth retail TI leased line market. BT provided us with internal survey evidence which it considered supported the view that Ethernet and digital leased lines are close substitutes. The survey indicates that there has been substantial new take-up of Ethernet services. In particular, the survey stated that 53% of TI customers were 'interested' in migrating to Ethernet in the next 3 years and 63% had already migrated some or all of their TI services to Ethernet. BT considered that the survey supported the view that migration was occurring in response to the perceived cost effectiveness and better service quality of carrier grade Ethernet.

3.76 BT also cited work by the consultants Analysys which forecast that spend on Ethernet would have a compound annual growth rate of 17% for the period 2007 to 2012.

3.77 Finally, BT also stated in its response that (consistent with the above reasoning) it plans to replace its legacy TI leased line platforms with an Ethernet-based service. This would be more flexible in terms of performance and price, and better suited to LAN-based connectivity than TI type services.

3.78 Having examined BT's survey evidence, we considered that this was likely to be less representative of the overall business market than our own end-user survey. BT's sample was relatively small (50 companies against our sample size of 450 companies). Further, the end-users interviewed appeared to be a sub-group of all business customers: the survey was restricted to companies with at least 250

employees (whereas our end-user survey also interviewed customers with a lower number of employees).

3.79 Despite this, we consider that BT's internal research was generally consistent with our own end-user survey, and in particular did not support our widening the product market boundaries beyond low bandwidth TI leased lines.

3.80 More specifically, the survey indicated that many customers had acquired Ethernet recently and many seemed to have shifted at least some of their TI lines to Ethernet lines (often while retaining TI too). Others were considering a move to Ethernet, but it was not clear that this would necessarily be a substitution away from TI leased lines (because many customers appear to be using multiple different forms of connectivity). Equally, some customers did not appear to be interested in Ethernet, and many seemed to use a large number of TI leased lines. This appeared to be because of the stability/reliability of TI relative to other services.

3.81 As noted above, the fact that some customers previously consuming low bandwidth TI leased lines are now purchasing Ethernet services does not necessarily mean that the two services should be placed in the same market, since it does not imply that sufficient switching would occur in response to a SSNIP to render it unprofitable. In fact the evidence from actual purchasing behaviour suggests that switching occurs relatively slowly even in response to quite large price differentials, and hence that a SSNIP is likely to be profitable. This is despite the fact that survey responses may sometimes suggest that willingness to consider switching in response to a SSNIP might be higher and even sufficient to make the SSNIP unprofitable. In the January 2008 consultation we explained that care was needed in interpreting replies to end user surveys, such as those reported in that document, in the light of all the evidence. Our interpretation is that continued migration towards AI circuits is likely but that in practice the degree of substitutability is not sufficient for the two to be regarded as part of the same market.

3.82 Overall, while a general theme of the survey (and the work by Analysys cited by BT) was that there was increased take-up of Ethernet and a broad sectoral shift to Ethernet, no information was provided which indicated that users of one service would switch to the other in response to a SSNIP. Moreover, some evidence was presented which indicated that Ethernet was still used together with TI services. This could suggest that currently, use of these services is to en extent complementary (although this may of course change in the future).

3.83 Finally, we consider BT's statements in regard to its plans to replace its legacy TI leased line platforms with an Ethernet-based service. We are aware that BT intends to replace the current separate networks which it uses to supply analogue, digital SDH and Ethernet leased lines with a single IP-based "next generation network" (NGN), which will also replace the PSTN currently used for metered services. There will be a significant period in which the new and old networks run in parallel but in the longer term, BT plans to switch off the old networks. BT's current intention is to retire its legacy SDH platform in 2014. For this to happen it will be necessary to develop "emulation" services which mean that customers who require particular functionality, for example, that associated with analogue or SDH leased lines, can obtain this from an IP-based service so that the obstacles to substitution which currently exist can be removed. In some cases, this will require technical development where it is not currently possible to meet customer requirements (for example, those of certain utility companies for precise synchronisation) using Ethernet technology. This implies that full technical substitutability is still a number of years away.

3.84 Our view is that there are separate retail markets for TI (leased line) and AI (Ethernet) services.

III. Does ADSL belong in the low bandwidth retail leased line market?

3.85 BT used similar reasoning to that used in relation to Ethernet to support its view that all ADSL services also belonged in the retail digital leased line market. BT did not rely on its end-user survey as supporting evidence. In fact, the survey suggested that these services were not substitutes: only a low proportion of respondents surveyed appeared interested in shifting to ADSL in the future.

3.86 Instead, the BT arguments were principally based on (a) the fact that volumes of leased lines are declining (particularly for 64kbit/s) and (b) take-up of ADSL is increasing, and (c) developments in VPN technology rendered previous differences between ADSL and leased lines less relevant. BT was also concerned that the data on which we relied in the January 2008 consultation (2006 data) was out of date. It presented new data which showed that:

- Demand for sub-2 Mbit/s services had declined almost 30% year on year between April 2004 and February 2008;
- SME demand for 2 Mbit/s services declined by 7.3% over April 2007 and March 2008;
- Large corporate and government customers' demand for 2 Mbit/s services declined by 3.2% over the same period.

3.87 Most OCPs advanced a more restricted version of this argument. They claimed that only 'business grade' ADSL (business broadband) belongs in the retail market with leased lines. Business broadband is defined to be an un-contended (or low contention) ADSL service, typically accompanied with high level SLAs.

3.88 The OCPs believe that business broadband offers quality akin to low bandwidth leased lines. More specifically, the OCPs stated that:

- un-contended ADSL can offer the same speeds/dedication as low bandwidth leased lines;
- Multi-Protocol Label Switching (MPLS)[18] technology in the VPN core ensures that the jitter, latency and lack of security normally associated with ADSL are reduced; and
- the high level SLAs that are typically offered with business broadband services mean that the 'retail wrap' of ADSL is the same as that offered with leased lines. This means that CPs will endeavour to fix an ADSL service quickly whenever it 'goes down' and that CPs generally commit to providing high quality service to customers.

3.89 The OCPs argued that this means that we could dismiss some of the end-user research – which suggests that end users place a great deal of importance on a product's service features – as a basis for placing business broadband in a separate market to leased line services.

[18] MPLS enables high priority traffic such as voice packets to be labelled so that they are routed over low latency routes.

3.90 Some OCPs repeated their view that business grade ADSL should be included in the market in their responses to the July 2008 consultation even though this issue was not discussed there. No new points were raised however.

Ofcom's response to whether a general quality broadband service competes in the retail leased lines market

3.91 In the January 2008 consultation we examined whether a general quality broadband service is likely to constrain leased lines.[19] As noted above, we concluded that these two services were unlikely to be substitutes.

3.92 We do not consider that any new evidence has been provided which would support our overturning the views set out in the January 2008 consultation.

3.93 As noted above, the fact that some customers have switched away from leased lines to ADSL is not sufficient to place these other products in the same product market. The two services would only be in the same market if there is sufficient switching between ADSL and leased lines to render unprofitable a SSNIP above the competitive price by a hypothetical monopolist of retail low bandwidth leased lines.

3.94 Indeed, given the differences in relative prices identified between ADSL and leased lines, the extent of switching away from leased lines even over the last 12 months in fact appears rather limited. This is particularly the case with respect to 2 Mbit/s services. The fact that there continues to be significant retail demand for low bandwidth leased lines, despite the availability of other products at often significantly lower prices, suggests that these products are not sufficiently close substitutes to form part of the same market (see also discussion at paragraph 3.74).

3.95 The paragraphs below consider a more specific issue i.e. whether a 'business broadband' service constrains retail leased lines. The argument here is that this category of broadband offers similar service features to at least some products in that market and that these products are therefore demand-side substitutes.

Ofcom's response to whether a 'business grade' broadband service competes in the retail leased line market

3.96 Our Wholesale Broadband Access (WBA) Review has examined whether 'business level' broadband constitutes a separate retail market from other types of broadband used by (smaller) business and residential customers, concluding that this is not the case.[20] This conclusion is based on evidence which suggests that the various types of asymmetric broadband are likely to be linked on the demand-side by a chain of substitution. In addition, the full range of retail asymmetric broadband services are likely to be supply-side substitutes because the underlying wholesale platform is the same in each case and is capable of supporting a wide range of services (high contention to very low or no contention).

3.97 In the paragraphs below we examine whether the availability of business grade ADSL is likely to constrain the prices of retail leased lines. If so, it might be

[19] Our Wholesale Broadband Access (WBA) Review has also concluded that retail leased lines are unlikely to constrain ADSL services. A comprehensive analysis of these issues is set out in the WBA review. Market definition is not always symmetric i.e. the result of a SSNIP test may differ depending on whether the starting point for the analysis is (in this case) broadband or retail leased lines.

[20] See pages 16 – 26 of Final Statement for WBA at:
http://www.ofcom.org.uk/consult/condocs/wbamr07/statement/statement.pdf

appropriate to include ADSL services in the same market as low bandwidth retail leased line market services.

The quality of business broadband

3.98 Business grade ADSL services are more likely to be a demand-side substitute for retail leased lines the closer the quality of service they offer is to that of a leased line. Our view, however, is that business broadband does not offer the same quality of service as low bandwidth digital leased lines. The key difference between these services is that business broadband offers a substantially less reliable/predictable performance than leased lines.

3.99 Significantly, the relative unreliability of ADSL is inherent to this service (i.e. it is not a service feature that can be significantly remedied by providing a high quality retail service or SLA). It arises from the fact that ADSL is provided over copper and additionally (unlike SDSL services) is a service provided with as little 'noise margin' as possible.[21] These factors make it susceptible to transient interference problems, the result of which is that performance is relatively unreliable and unpredictable. In comparison, most digital leased lines are provided either over fibre, which is inherently more robust to noise than copper[22] or over bonded copper, where each individual line is operated at a much higher noise margin than DSL.[23]

3.100 Bonded ADSL[24] may to some extent reduce the difference in quality and performance compared to leased lines. However, this service does not yet appear to be widely used. Moreover, much of the marketing material associated with this service states that the same guarantees that are associated with leased lines are not available over bonded ADSL. Therefore, it seems also likely that bonded ADSL is less reliable than leased lines.

3.101 Our view is therefore that the lower reliability of business broadband is likely to place it in a separate market to low bandwidth digital leased lines. According to the survey data set out in the January consultative document, reliability/availability is a service characteristic which 82% of end-users identified as 'business critical' and which almost all other users identified as 'very important'. No other service feature was as important to end-users. On this basis, it seems reasonable to conclude that digital leased lines and business broadband are not close demand-side substitutes.

3.102 It is also useful to identify other information in the end-user survey which could shed light on whether business broadband and retail leased lines are in the same market. The end-user survey did not seek to differentiate business broadband from other ADSL services, so user responses on ADSL lines do not necessarily apply to business broadband. However, most (83% of) end-users still make use of leased

[21] Apart from physical defects in the line/equipment over which a service is provided, degraded performance is caused by increased 'bit errors'. Bit errors are usually caused by signal 'noise' i.e. disturbance which interferes with intended operations. If signal noise is sufficiently large, it erodes the noise margin (i.e. the amount of headroom the receiver has before it starts misreading the signal resulting in bit errors). This leads to bit errors, which create performance problems. Services operating with a higher noise margin are therefore less susceptible to noise problems.

[22] This is because fibre is not a conductor and does not pick up electromagnetic radiation, which is from where most noise comes.

[23] SDSL is also significantly more reliable than ADSL. While both are provided over copper, SDSL operates with a higher noise margin than ADSL, which makes it less susceptible to noise problems.

[24] Bonded ADSL allows multiple ADSL lines to be bonded together to create larger internet pipes. ADSL bonding increases the physical upload & download capability of ADSL.

lines, and only 14% of end-users have discontinued their use of leased lines in the last three years. As noted above, the actual extent of switching from leased lines to ADSL appears so far to have been relatively small given the price differentials, and suggests that they are not sufficiently good substitutes to be regarded as part of the same market.

3.103 Our conclusion is that ADSL services do not form part of the same market as low bandwidth retail leased lines.

IV. 155 Mbit/s and 622 Mbit/s TI circuits are supplied in different markets

3.104 In the January 2008 consultation, we proposed that 155 and 622 Mbit/s services should be included in the same market. Most OCPs and various mobile network operators (MNOs) disagreed with this view. They claimed that the competitive conditions of these two services differed substantially, suggesting that the two services operated in separate markets. In the light of responses, Ofcom reconsidered the definition of the very high bandwidth retail TI market and set out revised proposals in the July 2008 consultation. Ofcom's reasoning, in making its revised proposals, is set out below.

3.105 As noted above, the methodology used in the January 2008 consultation which led us to place 155 and 622 Mbit/s lines in the same market was similar to that used in the 2004 review[25]. Using this approach, we considered the lowest cost way of meeting a particular bandwidth requirement and the extent to which this is affected by a SSNIP. If the analysis suggests that there is likely to be switching between higher and lower bandwidth circuits (in this case, 155 and 622 Mbit/s lines) over a significant range of bandwidth demand, this indicates that circuits at different bandwidths form a single market due to the existence of a 'chain of substitution'.

3.106 However, the existence of this chain depends on the distribution of customers according to demand for bandwidth. Specifically, in the case of 155 Mbit/s lines, these are only constrained by 622 Mbit/s lines if a customer acquires four or five 155 Mbit/s along the same route (i.e. if a customer is acquiring multiple 155 Mbit/s services as part of a higher bandwidth requirement). Because 622 Mbit/s lines are significantly more expensive than 155 Mbit/s lines, where 155 Mbit/s lines are acquired as single lines across a particular route (i.e. where customers only wish to acquire 155 Mbit/s of bandwidth) they are unlikely to be constrained by the price of 622 Mbit/s services. This remains the case even after a SSNIP is imposed on the 155 Mbit/s line.

3.107 After the publication of the January 2008 consultation, we received information from respondents suggesting that in fact most 155 Mbit/s lines are acquired as single lines along a particular route. This is supported by additional analysis which we have carried out. This shows that about 70% of retail 155 Mbit/s are provided with different customer ends, that is, only 30% of 155 Mbit/s lines link the same two points as another 155 Mbit/s line. This implies that most 155 Mbit/s lines are acquired as single circuits rather than as multiple lines across the same route. This suggests that the price of 155 Mbit/s lines is generally not constrained by the price of 622 Mbit/s lines (and hence that the two services operate in separate retail markets).

3.108 Even if there was a break in the chain of substitution, 155 and 622 Mbit/s circuits could still be regarded as being part of the same market if the competitive conditions

[25] In the 2003/04 Leased line market review this methodology (as well as other considerations such as the low number of 622 Mbit/s ends) led us to conclude that 155 and 622 Mbit/s lines belonged in separate markets.

of the supply of the two services were sufficiently homogeneous.[26] However, the evidence suggests that the competitive conditions of 155 Mbit/s and 622 Mbit/s lines differ significantly. BT appears to have around 11% of retail 622 Mbit/s sales, but 46-56% of 155 Mbit/s lines in the UK excluding Hull. This result does not seem to be explained by 'small number' issues because significant quantities of both lines are supplied.[27]

3.109 The evidence above, which was set out in the July 2008 consultation, suggests that 155 and 622 Mbit/s lines operate in separate markets. In particular, the evidence suggests that 155 Mbit/s lines are generally acquired as single lines across a particular route. Because 622 Mbit/s lines are significantly more expensive than 155 Mbit/s lines, where 155 Mbit/s lines are acquired as single lines across a particular route they are unlikely to be constrained by the price of 622 Mbit/s services.

3.110 Ofcom also considered again whether 155 Mbit/s services operate in a standalone market or whether they operate in a market with 34/45 Mbit/s services. We conducted extensive analysis on this point in the January 2008 consultation and concluded that 34/45 and 155 Mbit/s services are likely to operate in different markets. This view is primarily based on our bandwidth break analysis. This suggests that there is a sufficiently large price difference between 34/45 and 155 Mbit/s services that users wanting bandwidth at 34/45 Mbit/s (or below) will always prefer this to 155 Mbit/s lines (even if a SSNIP is imposed on 34/45 Mbit/s lines).

3.111 It is also the case that users wishing to acquire 155 Mbit/s of bandwidth or more will generally use a single 155 Mbit/s to provide the necessary service (rather than multiple 34/45 Mbit/s lines). This is because the price of two or three 34/45 Mbit/s far exceeds a single 155 Mbit/s. We have undertaken a sensitivity analysis of our bandwidth break analysis. This was carried out on the basis of adjusted data[28] which confirms our view that 34/45 Mbit/s lines operate in a separate market from 155 Mbit/s lines.

3.112 We therefore concluded that 155 Mbit/s services operate in a separate market to both 34/45 Mbit/s and 622 Mbit/s services.

3.113 Most respondents to the July 2008 consultation agreed with Ofcom's proposal to define separate markets for very high bandwidth TI retail circuits at bandwidths above 45Mbit/s and up to and including 155 Mbit/s and at bandwidths over 155 Mbit/s. BT said that it accepted the revised definition, although it erroneously linked the revised market definition to Ofcom's revised assumptions about economic build distance (see Sections 4 and 6 which deal with geographic market definition).

3.114 One respondent argued for a single market at all bandwidths and interfaces above 8 Mbit/s which should be considered "actually or prospectively competitive".

3.115 Ofcom believes that the evidence set out in the July 2008 consultation and summarised above supports the finding of separate markets for very high bandwidth

[26] Although homogeneity of competitive conditions is usually used in the context of geographic market definition as a reason for aggregating different areas not linked by demand or supply side substitution, it might also be used in the product market context.

[27] Around 721 622 Mbit/s ends are provided, as against around 1,224 155 Mbit/s ends.

[28] This data has been adjusted to take into account comments from some stakeholders that the data used in our original analysis did not reflect the "competitive price" benchmarks appropriate to a SSNIP test. This was a general complaint that was made about our bandwidth analysis, and not a complaint that focussed on our findings in relation to 34/45 and 155 Mbit/s markets (which stakeholders generally supported).

TI retail circuits at bandwidths above 45Mbit/s and up to 155 Mbit/s and at bandwidths over 155 Mbit/s.

3.116 Ofcom does not believe that a single market at all bandwidths over 8Mbit/s would be consistent with the evidence on substitutability of circuits at different bandwidths or of different interface types, which was set out in Ofcom's consultative documents and is summarised above. Moreover, there are clear variations in competitive conditions within this group of circuits.

3.117 We conclude that separate markets should be defined for:

Very high bandwidth TI retail services – over 45Mbit/s and up to 155 Mbit/s; and

Very high bandwidth TI retail services – over 155 Mbit/s

V. Bandwidth breaks: AI services

3.118 Several respondents disagreed with our conclusion that there are separate markets for low (up to and including 1Gbit/s) and high (over 1Gbit/s) bandwidth circuits. Similar issues were raised in relation to the wholesale market definition for AISBO services. The main points made by respondents which are relevant to retail market definition are set out below:

- Costs of different bandwidths: some CPs noted that the analysis was based on current BT cost data but that equipment prices that drive the differences in bandwidth costs are expected to fall faster than the cost of ducting and fibre. This will reduce the difference in (competitive) prices between low and high bandwidth AI circuits and hence increase the potential for demand-side substitution between high and low bandwidth AI services;

- Development of ORCHID-based platform: related to the previous point, some CPs highlighted that BT's deployment of its ORCHID platform would erode cost differences between different bandwidths. One respondent quoted from the BCMR consultation, which states, "the incremental costs of providing additional bandwidth [over the ORCHID platform] will not vary significantly".

- BT's ability to price services well above costs: one respondent argued that the fact that cost differences are much smaller than price differences for different bandwidth circuits services suggests that BT can use value-based pricing. According to this respondent, this suggests that all circuits are in the same market;

- Size of high bandwidth AI market: some CPs argued that the low volume of circuits above 1 Gbit/s does not justify a separate market being defined for these services. A related argument is that the low number of circuits means that it is not possible to draw conclusions about this market, as any results are likely to be affected by 'small number' issues;

- Future developments in competitive conditions: some CPs argued that the current view of competitive condition was not sufficiently forward looking. The current market is one of 'early adopters' which is largely based in London. As demand for these services matures, and the product becomes a 'mass market offering', these CPs argue that demand for backhaul services above 1 Gbit/s will develop in areas outside London and that competitive conditions in the provision

of high bandwidth services will become increasingly similar to competitive conditions in the provision of low bandwidth services.

3.119 In addition, two OCPs informed us that our estimates of market shares in the high bandwidth AI market were not robust. In particular, they informed us that various circuits that had been originally reported to us as AI high bandwidth services were in fact Wavestream services, which should therefore be excluded. The implications of this are primarily for the SMP assessment, but are dealt with here to the extent that they may impact on apparent differences in competitive conditions between low and high bandwidth markets.

3.120 Ofcom has reviewed its proposal to define separate markets for low and high bandwidth AI circuits in the light of the above responses. The above points are addressed in turn.

Revised cost analysis

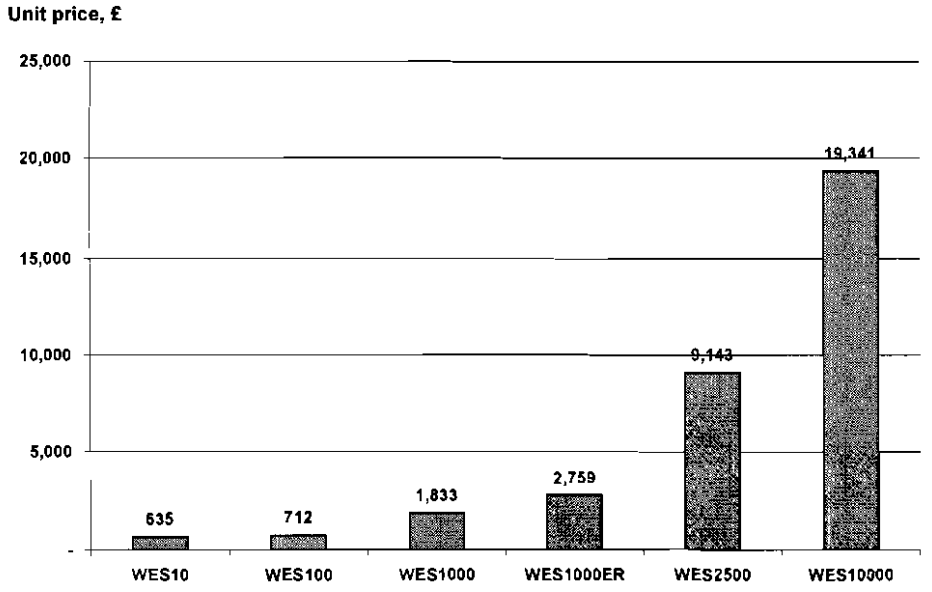
3.121 We have refreshed our cost analysis to take account of updated information on the structure of WES and BES costs, in order to check the robustness of our conclusions with regard to bandwidth breaks.

3.122 We have examined updated information relating both to the present time, and also examined whether our conclusions are likely to change in future due to Project ORCHID.

Present costs

3.123 We know that the way that the cost of provision varies with bandwidth is largely driven by the higher cost of equipment at higher bandwidths, since these costs form a large proportion of the total cost of provision, and other costs (ducts, fibre) are constant across bandwidths. We have therefore updated our analysis of the cost of equipment across bandwidths. Figure 3.1 below shows the result of the analysis, which uses information on the current cost of equipment provided by BT.

Figure 3.1 Cost of AISBO equipment across bandwidths



Source: BT 07/08 Regulatory Financial Statement.

3.124 The analysis above shows that there is a considerable difference in the cost of Ethernet equipment between 1Gbit/s, 2.5 Gbit/s (3.3 times higher than 1Gbit/s) and 10 Gbit/s (7 times higher than 1Gbit/s) circuits.

3.125 The updated data suggest that the additional cost of providing a 2.5 Gbit/s circuit compared to a 1 Gbit/s circuit is sufficient that they are unlikely to be seen as close demand-side substitutes, if price is equal to cost (as in a competitive market). There also appear to be significant differences between the costs of 2.5 Gbit/s and 10 Gbit/s circuits. However, there are still very few 10 Gbit/s circuits, and the significant difference we observe now might disappear once manufacturers sell more 10 Gbit/s boxes in the future.

Expected changes in costs

3.126 Ofcom has considered two main issues as part of its analysis of likely future developments in costs. The first is whether there is any evidence that suggests that the current difference in the cost of equipment between low and high bandwidth circuits will change over the lifetime of the current review (considered to be four years). The second is BT's project ORCHID, discussed in the next Section below.

3.127 Some operators have told us that they believe the cost of equipment for use at different bandwidths might converge significantly. However, for this to happen, either there must be developments in technology to allow the same equipment to be used with circuits at all bandwidths or, if it remains necessary to use different equipment at bandwidths above 1Gbit/s, its cost must fall to levels much closer to the cost of low bandwidth equipment.

3.128 It is possible to increase the bandwidth of AISBO circuits at up to 1Gbit/s and above by changing the port card in the NTE. However, for circuits at 2.5Gbit/s, SDH rather than Ethernet interfaces and dedicated NTE are employed. Therefore migration within the <2.5Gbps portfolios can be accomplished via card change whereas